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STATE DOCUMENTS
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MONTANA STATE HIGHWAY COMMISSION

November 17, 1949

I. PLAN FOR ALLOCATION OF PRIMARY FUNDS TO FINANCIAL DISTRICTS

In determining the percentage of highway funds which should be allotted to each of the twelve financial districts for primary road construction, the following system is used: the various routes are appraised in numerical order. Starting at the beginning of a route, it is divided into "sections"; a "section" being that portion of road length, within a project, which does not reflect a radical change in design or traffic pattern. These sections are numbered in sequence within the project; that is, section 1 of 3 sections, section 2 of 3 sections, etc. When an entire project is handled in one section it is called section 1 of 1 section. Proper sequence on the route is maintained by indicating the accumulated mileage attained on the route by each section.

The formula used to determine the deficiency is as follows:

% of deficiency = $(A + B + C + 3D + 3E + F)\ 1/10$

Maximum % of deficiency = 100%

All calculations are on a percentage basis showing percent of deficiency.

A = % Grade deficiency

B = % Alignment deficiency

C = % Sight Distance deficiency (vertical and horizontal)

D = % Surface deficiency (width and thickness)

E = % Base deficiency (width and thickness)

F = % Roadbed width deficiency

The next step in the formula is to determine the traffic. Traffic of the latest year of record is taken from the Highway Planning Survey "Traffic by Sections

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on the Federal Aid System". As requested by the Bureau of Public Roads, the figure thus obtained is expanded to an estimated 1970 traffic by the application of the factor 1.25, this figure having been determined by the Traffic Section after making a careful analysis of the traffic trends. The 1970 traffic figure is then used to determine the design standards to be used on the road. The "design category", as adopted by the A.A.S.H.O., is used in all cases.

Against the requirements thus obtained are placed the actual physical conditions of the road section as found in the road log. However, these conditions are modified; favorably, by any maintenance betterments which might have accrued, and adversely, especially regarding surfacing, by application of factors based on the "condition report" of the Bureau of Public Roads. This "condition report" is based on field inspection undertaken by the Bureau of Public Roads Engineer and covers every project. Project conditions are listed as good, fair, poor, or worn out in the report. These categories are converted to factors of 1 for good, 2/3 for fair, 1/3 for poor, and zero for worn out. The factors are applied only to surfacing and base. To illustrate; a section of roadway with a 24' x 3" mat and 6" base, reported in fair condition, would be shown as having a 24' x 2" mat and 4" base. Because of the relatively greater importance of surfacing and base, the deficiencies in these items are multiplied by 3. Other elements considered in determining deficiency are excess curvature, excess grades, sight restrictions and roadway width. After the deficiencies of the various items are computed, an overall deficiency is had for the section of roadway.

To determine the theoretically unconstructed mileage, the percent of deficiency thus obtained is applied to the length of the section; that is, a mile of road 50% deficient is equivalent to 0.5 mile of unconstructed.

The preceding processes are recorded on "coding and computation sheets" and then are punched on IBM cards. A total of unconstructed mileage for the State is obtained from these cards and a total for each financial district is also run. The ratio of the total for a district as compared to the total for the State provides the percentage of unconstructed mileage for the district.

It is probably well to note here; in addition to coding the length, traffic and physical features of each "section", the numbers of the county, financial district, route and project, are also coded, making it possible to sort the cards under any of those numbers and obtain totals. Coding reflects conditions as of July 1 of each year and includes all projects under contract and all maintenance betterments under authorization.

II. PLAN FOR ALLOCATION OF SECONDARY FUNDS TO FINANCIAL DISTRICTS

Determination of deficiencies on the Secondary System is arrived at by use of the formula employed on the Primary System, with the exception that Secondary Highway standards are used instead of Primary Highway standards.

The Secondary highway mileage upon which the application of the formula is based, is the total of that mileage within the individual counties, and in turn within the financial districts and within the state as a whole, which was determined to be eligible for inclusion in the state secondary system in accordance with the plan as outlined below.

METHOD FOR DETERMINING TOTAL ELIGIBLE MILEAGE FOR STATE SECONDARY HIGHWAY SYSTEM:

The mileage of rural roads eligible for inclusion, at this time, in the secondary highway system was determined in the following manner:

For the purpose of initiating a Federal Aid Secondary system of highways it was necessary that a fair basis of procedure be established. No particular requirements with respect to the size or extent of such system was set by law, or by the regulations of the Bureau of Public Roads, but it was judged from a study of the data available at the time that a 10% selection, 6,822 miles, would adequately provide for an approved system of approximately 5% and allow for expansion of that system where advisable. This mileage is roughly comparable with the 5,786 miles of primary highway and, conceivably, with the funds estimated to be available, could be improved over a ten or twenty year period. This mileage, 6,822 miles, also was believed to be sufficiently large to provide a broad and a fair base upon which the funds for secondary highway construction could be equitably allocated to the various counties and financial districts. Therefore, a total of 6,822 miles was determined to be eligible, within the state, for placement upon the secondary highway system.

It was not the intent that ten per cent of the rural mileage for each county would be eligible for the secondary system. If this were the case, many inequities in the allocation of construction funds would result, as certain counties have every third or fourth section line established as a county road, regardless of the negligible traffic carried, whereas other counties have but comparatively few miles of county road upon which are concentrated a much heavier traffic. The serving of traffic being the real objective of the secondary road program, the plan as outlined in subsequent paragraphs was devised for determining, within the counties and the financial districts, the total of rural mileage which would be eligible for the secondary highway system.

The mean of two methods was used in arriving at the eligible secondary road mileage for each county.

First, the total of vehicle miles generated on all rural roads in the state, except those included upon the primary system or within National Parks and military reservations and also excepting those planned for improvement with Forest Highway or Indian Service funds was determined.

The total of vehicle miles generated on the rural roads in a county was determined and divided by the state total, giving a percentage for the county. This percentage was multiplied by the total eligible mileage, 6,822 miles in all, the result being the county's eligible secondary road mileage based on vehicle miles traveled.

Second, the IBM cards covering all rural roads in the state, except those previously noted, were sorted as to average daily traffic. Regardless of county, the cards were sorted so that the road with the highest traffic would be first; next highest, second, etc. These cards were then tabulated and a running mileage total taken, until the total reached 6,822 miles.

The IBM cards which covered the roads included in that 6,822 mile total were then sorted as to counties and a total of mileage taken from them for each county. This mileage total comprised the county's eligible mileage based on traffic priority.

As the total obtained for a county by the first method closely approximated the total obtained by the second method, the average of the two totals for a county was used as the total of eligible secondary mileage for that county. Based upon such eligible secondary highway mileage, as determined above, the statutory formula is applied to determine the secondary construction fund allocations.

FEDERAL AID SECONDARY SYSTEM STUDY
MILEAGE ALLOCATION AND TRAFFIC DETAILS

MONTANA

AUGUST, 1944

County	1/ Veh. Mi. off Primary System	% of Veh. Mi. off Primary System	Mileage Allocated Based on Vehicle Miles	Mileage Allocated Based on State Traffic Priority	Average Mileage of the two Allocations	2/ Traffic of Interest	Veh. Mi. Served by Mileage Shown in Col. 6	% of Veh. Mi. Served Col. 8 ÷ Co. 2	3/ 1940 Vehicle Miles on Primary System	Traffic Served Col. 10 + Col. 8	4/ Veh. Mi. Col. 10 + Col. 2	% of Eligible Veh. Mi. Served by Primary and Secondary Col. 11 ÷ Col. 12	5/ Veh. Mi. on All Roads in the State	% of all Veh. Mi. in State Served by Primary and Secondary Col. 11 ÷ Col. 14
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Beaverhead	15,673	2.075	141.6	146.0	143.8	25	9,599	61.2	31,747	41,346	47,420	87.2	47,975	86.2
Big Horn	9,529	1.262	86.1	80.8	83.5	25	6,965	73.0	36,130	43,095	45,659	94.4	56,313	76.5
Blaine	16,484	2.183	148.9	180.5	164.7	24	8,081	49.0	26,214	34,295	42,698	80.3	48,113	71.3
Broadwater	7,227	.957	65.3	60.0	62.7	25	4,317	59.7	26,650	30,967	33,877	91.4	34,471	89.8
Carbon	21,658	2.868	195.7	205.2	200.4	24	16,401	75.7	53,093	69,494	74,751	93.0	77,511	89.6
Carter	9,925	1.314	89.6	92.0	90.8	24	3,332	33.6	5,235	8,567	15,160	56.5	15,438	55.5
Cascade	30,795	4.078	278.2	287.8	283.0	24	20,183	65.5	98,266	118,449	129,061	91.8	131,851	89.9
Chouteau	24,494	3.243	221.2	181.6	201.4	24	10,648	43.4	28,041	38,689	52,535	73.6	52,803	73.3
Custer	9,330	1.235	84.3	75.4	79.9	24	3,079	33.0	38,838	41,917	48,168	87.0	48,168	87.0
Daniels	14,167	1.876	128.0	154.6	141.3	25	7,957	56.2	6,793	14,750	20,960	70.4	22,235	66.3
Dawson	14,125	1.870	127.6	116.5	122.0	25	6,216	44.0	32,516	38,732	46,641	83.0	46,641	83.0
Deer Lodge	8,182	1.083	73.9	88.2	81.0	24	4,547	55.6	31,320	35,867	39,502	90.8	40,532	88.5
Fallon	6,441	.853	58.2	52.9	55.5	25	1,958	30.4	9,286	11,244	15,727	71.5	15,727	71.5
Fergus	30,329	4.016	274.0	283.5	278.8	24	18,642	61.4	41,191	59,833	71,520	83.6	71,635	83.5
Flathead	20,923	2.771	189.0	203.8	196.4	24	15,280	73.0	65,763	81,043	86,686	93.5	92,801	87.3
Gallatin	37,768	5.001	341.2	336.6	338.9	24	22,196	58.8	69,906	92,101	107,674	85.5	111,214	83.8
Garfield	6,386	.846	57.7	36.2	47.0	24	1,911	29.9	10,466	12,377	16,852	73.4	16,852	73.4
Glacier	7,804	1.033	70.5	66.9	68.7	24	5,962	76.4	46,636	52,598	54,440	96.6	65,441	80.4
Golden Valley	5,394	.714	48.7	55.4	52.0	24	2,169	40.2	4,754	6,923	10,148	68.2	10,151	68.2
Granite	4,225	.559	38.1	51.5	44.8	24	1,784	42.2	37,131	38,915	41,356	94.1	42,594	91.4
Hill	24,667	3.266	222.8	221.1	222.0	25	13,886	56.3	37,348	51,234	62,015	82.6	63,340	80.9
Jefferson	7,407	.981	66.9	72.0	69.5	25	4,659	62.8	65,064	69,723	72,471	96.2	74,067	94.2
Judith Basin	13,895	1.840	125.5	157.8	141.6	24	6,911	49.7	21,622	28,533	35,517	80.3	35,856	79.6
Lake	21,254	2.814	192.0	189.0	190.5	24	15,555	73.2	51,715	67,270	72,969	92.2	75,561	89.0
Lewis & Clark	15,884	2.103	143.5	169.0	156.3	25	11,024	69.4	58,733	69,757	74,617	93.5	77,341	90.2
Liberty	7,701	1.020	69.6	59.3	64.5	24	2,516	32.6	6,890	9,406	14,591	64.5	14,591	64.5
Lincoln	3,796	.503	34.3	27.4	30.9	24	1,193	31.4	21,573	22,766	25,369	89.7	29,466	77.3
Madison	14,050	1.860	126.9	134.9	130.9	24	6,972	49.6	26,014	32,986	40,064	82.3	40,863	80.7
McCone	6,667	.883	60.2	41.4	50.8	25	1,771	26.6	9,977	11,748	16,644	70.6	16,644	70.6
Meagher	4,775	.632	43.1	55.3	49.2	27	2,367	49.6	11,025	13,392	15,800	84.7	16,171	82.8
Mineral	846	.112	7.6	8.4	8.0	27	324	38.3	45,490	45,814	46,318	98.9	48,160	95.1
Missoula	13,820	1.830	124.8	120.5	122.6	24	10,448	75.6	89,947	100,395	103,767	96.7	107,813	93.1
Musselshell	7,531	.997	68.0	55.3	61.7	24	2,823	37.4	27,147	29,970	34,678	86.4	34,678	86.4
Park	9,352	1.238	84.4	117.3	100.9	25	4,777	51.1	45,126	49,903	54,478	91.6	56,839	87.8
Petroleum	6,158	.815	55.6	53.3	54.5	24	2,700	43.8	5,692	8,392	11,850	70.8	11,850	70.8
Phillips	19,351	2.562	174.8	158.7	166.8	25	10,042	51.9	20,477	30,519	39,828	76.6	40,838	74.7
Pondera	23,207	3.073	209.6	220.9	215.3	24	17,903	77.1	20,685	38,588	43,892	87.9	44,400	86.9
Powder River	7,859	1.040	70.9	48.7	59.8	24	1,963	25.0	8,778	10,741	16,637	64.6	17,463	61.5
Powell	9,040	1.197	81.7	98.4	90.0	25	5,189	57.4	42,317	47,506	51,357	92.5	51,624	92.0
Prairie	6,316	.836	57.0	34.5	45.8	24	1,828	28.9	11,444	13,272	17,760	74.7	17,760	74.7
Ravalli	19,419	2.571	175.4	185.0	180.2	24	13,776	70.9	30,965	44,741	50,384	88.8	51,024	87.7
Richland	15,863	2.100	143.3	144.0	143.6	24	6,887	43.4	23,769	30,656	39,632	77.3	39,632	77.3
Roosevelt	15,288	2.024	138.1	156.4	147.3	25	6,369	41.7	39,498	45,867	54,786	83.7	56,522	81.1
Rosebud	12,292	1.628	111.1	151.1	131.1	27	6,068	49.4	30,477	36,545	42,769	85.4	44,996	81.2
Sanders	6,469	.857	58.5	45.7	52.1	24	2,384	36.9	27,398	29,782	33,867	87.9	39,398	75.6
Sheridan	15,529	2.056	140.3	124.8	132.5	25	6,474	41.7	11,580	18,054	27,109	66.6	29,892	60.4
Silver Bow	6,411	.849	57.9	42.2	50.0	25	4,867	75.6	60,429	65,296	66,840	97.7	73,333	89.0
Stillwater	19,301	2.556	174.4	144.8	159.6	24	13,023	70.6	22,051	35,674	41,352	86.3	41,999	84.9
Sweet Grass	7,803	1.033	70.5	74.6	72.5	24	4,431	56.8	20,333	24,764	28,136	88.0	28,368	87.3
Teton	21,769	2.883	196.7	234.6	215.6	25	12,147	55.8	27,411	39,558	49,180	80.4	49,197	80.4
Toole	18,504	2.450	167.1	120.9	144.0	25	10,599	57.3	30,360	40,959	48,864	83.8	48,864	83.8
Treasure	3,668	.486	33.2	30.7	32.0	24	1,627	44.3	12,969	14,596	16,637	87.7	16,637	87.7
Valley	25,114	3.326	226.9	224.0	225.5	24	12,825	51.1	57,023	69,848	82,137	85.0	82,846	84.3
Wheatland	4,060	.538	36.7	23.3	30.0	25	1,145	28.2	13,262	14,407	17,322	83.2	17,369	82.9
Wibaux	4,272	.566	38.6	28.6	33.6	25	1,761	41.2	5,954	7,715	10,226	75.4	10,226	75.4
Yellowstone	34,966	4.630	315.9	292.7	304.3	24	24,487	70.0	111,244	135,731	146,210	92.8	149,600	90.7
Total	755,163	100.000	6,822.0	6,822.0	6,822.0		425,548	56.4	1,851,763	2,277,311	2,606,908	87.4	2,703,694	84.2

1/ Does not include vehicle miles in National Parks, Forests, Indian and Military Reservations.

2/ This column represents the lowest traffic served by the tentative Secondary System.

3/ Includes all vehicle miles on the Primary system whether inside or outside of National Parks, Forests, Indian and Military Reservations.

4/ Does not include vehicle miles off the Primary system in National Parks, Forests, Indian and Military Reservations.

5/ Includes all vehicle miles in the State whether inside or outside of National Parks, Forests, Indian and Military Reservations.

November 1949

MONTANA STATE HIGHWAY COMMISSION

CURRENT FACTORS FOR DISTRIBUTING F.A.S. FUNDS TO THE COUNTIES

(Determined by Formula Described Herein)

County & Financial Districts	Allocated Mileage	Equiv. Uncon.	Percent
Flathead	196.4	159.7	3.02
Lake	190.5	157.1	2.97
Lincoln	30.9	25.9	0.49
Total Dist. 1	417.8	342.7	6.48
Blaine	164.7	120.3	2.28
Glacier	68.7	54.0	1.02
Hill	222.0	157.3	2.98
Liberty	64.5	28.8	0.54
Toole	144.0	118.4	2.24
Total Dist. 2	663.9	478.8	9.06
Daniels	141.3	114.1	2.16
Phillips	166.8	121.6	2.30
Roosevelt	147.3	110.6	2.09
Sheridan	132.5	101.2	1.92
Valley	225.5	176.6	3.34
Total Dist. 3	813.4	624.1	11.81
Dawson	122.0	106.3	2.01
McCone	50.8	42.3	0.80
Prairie	45.8	18.7	0.36
Richland	143.6	105.3	1.99
Wibaux	33.6	28.1	0.53
Total Dist. 4	395.8	300.7	5.69
Fergus	278.8	228.0	4.31
Garfield	47.0	39.5	0.75
Petroleum	54.5	36.9	0.70
Total Dist. 5	380.3	304.4	5.76
Cascade	283.0	244.1	4.62
Chouteau	201.4	147.0	2.78
Judith Basin	141.6	98.9	1.87
Pondera	215.3	169.2	3.20
Teton	215.6	165.5	3.13
Total Dist. 6	1056.9	824.7	15.60
Broadwater	62.7	47.8	0.90
Jefferson	69.5	51.0	0.97
Lewis & Clark	156.3	127.3	2.41
Total Dist. 7	288.5	226.1	4.28
Granite	44.8	38.9	0.74
Mineral	8.0	7.0	0.13
Missoula	122.6	64.3	1.22
Powell	90.0	60.4	1.14
Ravalli	180.2	156.2	2.95
Sanders	52.1	43.4	0.82
Total Dist. 8	497.7	370.2	7.00
Beaverhead	143.8	121.2	2.29
Deer Lodge	81.0	52.9	1.00
Madison	130.9	116.3	2.20
Silver Bow	50.0	37.3	0.71
Total Dist. 9	405.7	327.7	6.20
Gallatin	338.9	290.1	5.49
Meagher	49.2	25.6	0.48
Park	100.9	93.2	1.76
Sweet Grass	72.5	66.6	1.26
Wheatland	30.0	21.4	0.41
Total Dist. 10	591.5	496.9	9.40
Big Horn	83.5	46.3	0.88
Carbon	200.4	148.7	2.81
Golden Valley	52.0	39.3	0.74
Musselshell	61.7	50.8	0.96
Stillwater	159.6	110.0	2.08
Treasure	32.0	20.5	0.39
Yellowstone	304.3	270.6	5.12
Total Dist. 11	893.5	686.2	12.98
Carter	90.8	67.5	1.27
Custer	79.9	68.5	1.30
Fallon	55.5	44.0	0.83
Powder River	59.8	41.0	0.78
Rosebud	131.1	82.4	1.56
Total Dist. 12	417.1	303.4	5.74
GRAND TOTAL	6822.1	5285.9	100.00

These factors or percentages are based on a tentative 10% system, not on the presently approved mileage.